



Awareness During Anaesthesia: The Results Of A Questionnaire Survey—A Narrative Review

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Abstract

Intraoperative awareness under general anesthesia remains a significant concern due to its potential psychological impact on patients. Estimating its incidence and identifying associated risk factors are crucial for enhancing patient safety. This review covers the questionnaire-based cross-sectional survey conducted among anesthesiologists and patients to assess the occurrence of anesthesia awareness. Data regarding the use of depth of anesthesia monitoring and episodes of definite or suspected awareness will be covered, along with reported cases. The studies represented a large number of anesthetic procedures, among which only a small portion involved definite or possible awareness, indicating the overall incidence. Proper anesthetic dosing, vigilant monitoring, and careful assessment of high-risk patients are vital to reduce its occurrence.

Keywords: *Intraoperative awareness, general anesthesia, questionnaire-based studies, lasting psychological trauma*

1. Introduction

General anesthesia is an important aspect of modern surgery, and it is induced for the administration of a state of unconsciousness, analgesia, amnesia, and muscle relaxation during the performance of operative procedures. However, certain complications can occur during anesthesia, one of which is intraoperative awareness, a rare but potentially distressing complication. Intraoperative awareness is defined as the intended and explicit recall of sensory perceptions during general anesthesia. This is a complication of anesthesia whereby a patient, during a surgical procedure, is partially conscious and later recollects the events that occurred during the period of anesthesia [1]. It is broadly classified into two types: Explicit (conscious) memory and Implicit (unconscious) awareness. Explicit awareness involves the deliberate recall of past experiences, while implicit awareness refers to changes in behavior or performance influenced by previous experiences without conscious awareness. One of the major concerns for patients scheduled for surgery is the possibility of waking up during the procedure. Although the risks of anesthesia are less with modern advances, intraoperative awareness

during anesthesia is a matter of concern. Patients who experience intraoperative awareness may recall auditory or tactile sensations during the procedure. Some patients may be able to hear the conversations. They may feel pressure or pain and surgical manipulation. These perceptions may be accompanied by uncomfortable emotions such as inability to move, inability to communicate, feeling of helplessness, panic, and, in some cases, an intense fear of death. The combination of being conscious and paralyzed due to the use of neuromuscular blocking agents makes this a frightening experience. The incidence of intraoperative awareness varies with the type of surgery, the type of anesthesia, and the patient population. In the general surgical patient population, the incidence is estimated to be about 1-2 cases in 1000 patients undergoing general anesthesia. However, in some situations, such as cardiac surgery, trauma surgery, emergency procedures, and in patients with severe hemodynamic instability, lighter planes of anesthesia may be used to maintain cardiovascular stability. Several risk factors have been identified as being associated with intraoperative awareness. These include inadequate



dosage of anesthesia, equipment failure, use of neuromuscular blocking agents, total intravenous anesthesia, difficult airway management, and patient-related factors such as a history of anxiety disorders. Those with a rapid sequence induction may be at increased risk for intraoperative awareness. Previous awareness under anesthesia may also have a higher risk of recurrence, although some patients who experience intraoperative awareness do not develop long-term psychological consequences; others may suffer from significant emotional distress. In certain cases, the experience can lead to post-traumatic stress disorder (PTSD), characterized by symptoms [2]. Another challenge, such as anxiety, insomnia, and identifying intraoperative awareness, is that many patients may not voluntarily report their surgery. Patients may remember the experience several days or even one to two weeks postoperatively, making postoperative follow-up and structured questioning. Furthermore, recall of these events may not occur immediately after some essential factors for accurate detection. With the development of modern monitoring techniques, such as depth-of-anesthesia monitors (e.g., Bispectrality index monitoring), efforts have been made to reduce the incidence of awareness during surgery. However, despite these technological advancements, the possibility of intraoperative awareness cannot be eliminated. Considering the potential psychological impact and medicolegal implications associated with intraoperative awareness, it is important to understand its incidence and contributing factors in clinical practice. Inadequate anesthesia can result in intraoperative awareness. This risk can be minimized when a skilled anesthetist administers anesthesia based on a thorough understanding of pharmacology, along with patient and surgical factors, supported by appropriate clinical monitoring. Using volatile anesthetic agents at concentrations of at least 0.5 MAC may help reduce awareness; however, this approach limits the use of total intravenous anesthesia (TIVA) and may increase the risk of hypotension. Equipment malfunction is another potential cause [3]. Benzodiazepines do not reliably prevent awareness. Therefore, the present study was undertaken to estimate the incidence of intraoperative

awareness among patients undergoing surgery under general anesthesia. The selection criteria for the review include the articles based on questionnaire studies, like cross-sectional surveys, including patients and anesthetists to assess the awareness during anesthesia, which do not include observational studies and reviews. The articles were taken from PubMed and Google Scholar [4].

2. Incidence of Awareness During General Anesthesia

Intraoperative awareness with recall (AWR) is a rare complication of general anesthesia in which the patient becomes conscious during surgery and later recalls events shown in Table 1.

Table 1 Incidence reported in major studies

Author/ year	Sample size	Awareness cases	incidence
Sebel et al., 2004	19,575 patients	~25 cases	0.13%
Lakshmi et al., 2023	240 patients	5 cases	2%
Najeeb et al., 2024	383 patients	7 cases	1.8%
Morimoto et al., 2011	85,156 anaesthetists	24 cases	0.028%

2.1.Overall Global Incidence

Larger clinical studies report that the overall

incidence ranges from: 0.1% - 0.2% or approximately 1 to 2 cases per 1,000 patients undergoing general anesthesia [5]. Across these studies, the overall incidence of intraoperative awareness during general anesthesia ranges from approximately 0.028% to 2%, with most large-scale studies reporting around 0.1-0.2% (1-2 cases per 1000 patients) shown in Table 2, 3 and 4.

Table 2 Intraoperative Experiences reported by patients

Variable	category	Incidence
Nature of surgery	Low-risk surgery	86.2%
	High-risk surgery	13.8%
Type of procedure	Minor procedure	61.1%
	Major procedure	38.9%

Experience	Percentage
Auditory perceptions	48%
Inability to move	48%
Anxiety or distress	36%
Pain	28%
sensation	24%

Table 3 Common Experiences During Awareness

Experience During Surgery	Percentage
Pain during surgery	2.1%
Feeling of being touched	1.8%
Hearing sounds	2.1%
Sensation of the endotracheal tube	1.6%

The majority of patients had undergone low-risk surgeries, i.e., 86.2%, while 13.8% had undergone high-risk surgeries. In addition, 61.1% were minor surgeries, and 38.9% were major surgeries. However, no statistically significant association was found between awareness, the nature of surgery, and the type of surgery. Among patients who had experienced awareness, several sensory perceptions were reported, such as pain during surgery (2.1%), feeling of being touched (1.8%), hearing sounds (2.1%), and feeling of an endotracheal tube in the throat (1.6%) (Table 1.3). Similarly, in the study by Sebel PS et al., it was reported that auditory perceptions (48%), inability to move (48%), anxiety/distress (36%), pain (28%), and feeling of endotracheal tube (24%) were the most common experiences reported by patients during awareness. Dreaming under anesthesia was also reported, with a range of 2.5 to 6.1%, although the dreams were not disturbing. Hemodynamic instability was reported in 4.4%, whereas 95.6% of the patients had stable hemodynamics. Cases of awareness were mostly reported under propofol anesthesia, with a higher incidence when technical problems were involved, e.g., problems with the infusion line or the pumps. The use of BIS was highly varied, with only 26% of anesthesiologists using BIS as a matter of routine. Reported incidences and their prevention strategies. During surgery, patients with intraoperative awareness may report a range of sensations. Hearing voices or sounds in the operating room, sensing the endotracheal tube's presence, feeling pain or pressure, feeling stressed or anxious, and occasionally being unable to move or breathe because of the effect of neuromuscular blocking agents are all

Table 4 Common Experience During Awareness

frequently reported experiences. These incidents can be extremely upsetting and may result in psychological effects like anxiety, insomnia, nightmares, or even post-traumatic stress disorder (PTSD). Several preventive measures are advised to reduce the possibility of intraoperative awareness. These include using depth of anesthesia monitoring methods like Bispectrality index (BIS) monitoring, monitoring the minimum alveolar concentration (MAC) of volatile anesthetics, and approximately dosing anesthetic agents [6]. To guarantee that anesthetic agents are administered, early detection and management of awareness events can be aided by postoperative evaluation using structured interviews such as the modified Brice questionnaire.

3. Discussion

Awareness with recall under general anesthesia is a rare but significant complication of anesthetic care. The incidence of this complication, based on the studies under review, ranged from 0.028% to 2%. This is in line with previous reports of an incidence of approximately 1-2 per 1,000 anesthetic procedures. A study of this nature, carried out over several centers by Sebel PS et al., reported a low incidence of 0.13% of definite awareness, whereas other studies reported slightly higher rates of this complication of anesthetic care. This could be due to differences in the study design, sample size, patient population, and methods of detection of awareness, including the use of the modified Brice questionnaire, which is considered standard for post-operative awareness assessment. The patient-related factors may also be a reason for the occurrence of awareness. In some studies, it has been shown that high ASA physical status and emergency procedures are linked with increased awareness. This may be because the depth of anesthesia has to be reduced in hemodynamically unstable patients. In other studies, demographic factors like age and gender have not shown any association with awareness. This has also been shown in the study by Lakshmi M et al. The sensations experienced by the patients during awareness have varied from auditory hallucination, inability to move, pain, and anxiety. This may be due to the neuromuscular blockade that does not allow movement, along with being partially awake. This

leads to a high level of psychological distress. According to previous literature, some patients may also have psychological sequelae like post-traumatic stress disorder (PTSD). In the context of the phenomenon of awareness under anesthesia, it has been found that various technical factors also contribute to the phenomenon. Reports from various studies indicate that the phenomenon of awareness has been reported under various circumstances due to the malfunction of propofol infusion, incorrect dosing of the anesthetic, and inadequate monitoring of the depth of anesthesia. The use of monitoring tools such as BIS may help to avoid the phenomenon of awareness under anesthesia. From the literature reviewed above, it may be concluded that the phenomenon of awareness under the effect of anesthesia is rare [7]. However, the phenomenon is significant. The phenomenon may be prevented with the help of appropriate dosing of the anesthetic, monitoring the depth of anesthesia, and the use of the modified Brice questionnaire.

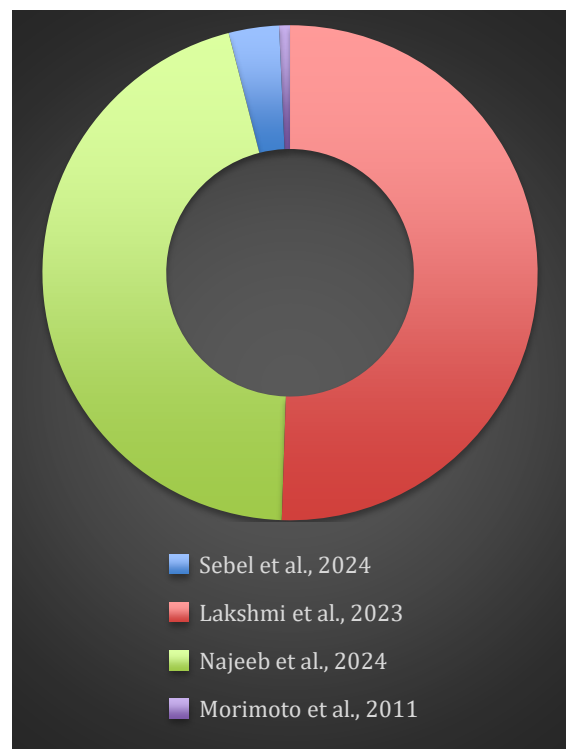


Figure 1 Phenomenon of Awareness Under the Effect of Anesthesia

Conclusion

Intraoperative awareness during general anesthesia is



an important but rare complication that can cause psychological distress in patients. The overall incidence of intraoperative awareness in patients undergoing general anesthesia is between 0.1 and 0.2%, although variations can occur depending on different studies [8-11]. Larger studies show a relatively lower incidence of intraoperative awareness in patients undergoing general anesthesia, which is between 0.1 and 0.2%, although variations can occur depending on different studies. Larger studies show a relatively lower incidence than smaller studies. Despite the low incidence of intraoperative awareness in patients undergoing general anesthesia, it is an important complication that can cause anxiety and fear in patients. It can also cause psychological distress in patients in the form of post-traumatic stress disorder. Therefore, proper anesthetic management and administration of anesthetic agents in adequate general anesthesia. The overall incidence of intraoperative awareness in patients undergoing general anesthesia can be reduced by improving anesthesia techniques and monitoring depth. Early detection by interviewing the patients and counselling them can also help to manage and minimize the effects of intraoperative awareness in patients. Improvements in anesthesia techniques and monitoring depth can help minimize the incidence of intraoperative awareness in patients undergoing general anesthesia.

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